

PATENT  
674509-2020REMARKS

The Examiner is thanked for courtesies extended during the January 7, 2002 and February 7, 2002 telephonic interviews.

Attached hereto is a marked up version of the changes made to the specification by this amendment. The attachment is captioned "Version With Markings to Show Changes Made."

Reconsideration and withdrawal of the rejections of this application and consideration and entry of this paper are respectfully requested in view of the herein remarks and accompanying information, which place the application in condition for allowance.

**I. STATUS OF CLAIMS AND FORMAL MATTERS**

Claims 1, 9, 21 and 26-39 are pending. Claims 1, 9 and 21 are amended and claims 2-8, 10-20 and 22-25 are cancelled without prejudice, without admission, without surrender of subject matter, and without any intention of creating any estoppel as to equivalents. Claims 26-39 are added.

No new matter is added. Support for the amended claims is found throughout the specification.

It is submitted that these claims are patentably distinct from the references cited by the Examiner, and that these claims are in full compliance with the requirements of 35 U.S.C. §112. The amendments of the claims herein are not made for the purpose of patentability within the meaning of 35 U.S.C. §§ 101, 102, 103 or 112; but rather the amendments are made simply for clarification and to round out the scope of protection to which Applicants are entitled.

**II. THE REJECTION UNDER §112, FIRST PARAGRAPH, IS OVERCOME**

Claims 1-6, 8 and 10-25 were rejected under 35 U.S.C. §112, first paragraph, as allegedly containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors had possession of the claimed invention at the time the application was filed. The Office Action contends that the application fails to teach the method of the claimed invention with regard to any recombinant enzyme expressed in any plant to produce any anti-oxidant from a glucan substrate. The rejection is traversed.

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The lead case on the written description requirement is *In re Edwards*, 568 F.2d 1349 (C.C.P.A. 1970). The application of that case by the Federal Circuit is the state of the law on the issue. According to *Edwards*, the function of the written description requirement is to:

[E]nsure that the inventor had possession, as of the filing date of the application relied on, of the specific subject matter later claimed by him; to comply with the description requirement, it is not necessary that the application describe the claimed invention in *ipsis verbis*; all that is required is that it reasonably convey to persons skilled in the art that, as of the filing date thereof, the inventor had possession of the subject matter later claimed by him.

(*Id.* at 1351-52).

Thus, determining whether the written description requirement is satisfied requires reading the disclosure in light of the knowledge possessed by a skilled artisan. Such knowledge can be established by reference to patents and publications available to the public prior to the filing date of the application.

Applying the law to the instant facts, it is clear possession did exist at the time of filing. The present invention is directed to, *inter alia*, the process of preparing an anti-oxidant. A skilled artisan, reading the instant specification, would readily understand that possession existed because this same artisan would know how to prepare the anti-oxidant anhydrofructose *in situ*, using a recombinant enzyme, such as, for example, glucan lyase. To this end, the Examiner is invited to review publications evidencing the preparation and use of glucan lyases (for example, UK Application GB 2 294 048, WO 95/10616, WO 95/10618 and WO 94/09122). Applicants had possession of the claimed invention.

Thus, it is respectfully submitted that the assertion in the Office Action that the claims are not supported by adequate written description is obviated. Consequently, the Section 112, first paragraph, rejection should be reconsidered and withdrawn; and, such relief is respectfully requested.

### III. THE REJECTIONS UNDER §103 ARE OVERCOME

Claims 1-19 and 20-25 were rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Yu(a) or Yu(b) in view of Poulsen and Ishida *et al.* and Perl *et al.* The cited documents fail to disclose, suggest, or motivate a skilled artisan to practice the presently claimed invention. The rejection is respectfully traversed.

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The present invention is predicated upon the realization that the anti-oxidant anhydrofructose could be prepared in plants *in situ*. Prior to the present invention, anhydrofructose was produced in microorganisms, such as bacteria, yeast and fungi, and research was focused on large-scale production of anhydrofructose using microorganisms (see Yu(a) and Yu(b)).

The state of the law in the Federal Circuit requires that the suggestion or motivation to practice the claimed invention must be present in the cited art, and not gleaned from the Applicant's specification. Further, picking and choosing portions from a plethora of disparate references in a hindsight attempt to formulate an obviousness rejection is prohibited. In the instant case, the only suggestion or motivation to provide for the recombinant expression of glucan-metabolizing enzymes in plants to produce anti-oxidants *in situ* is found in the Applicant's disclosure. A *prima facie* case of obviousness has not been made.

There is no teaching or suggestion in Yu(a) or Yu(b) that anhydrofructose could or should be produced *in situ* in plants. Once this was envisaged, Applicants agree that there was no difficulty in transforming the plants, however, the invention is the realization that this should be done *in situ* in plants. Thus, the invention lies in solving the problems associated with producing anhydrofructose in microorganisms, the method used prior to the instant invention.

It is asserted on page 10 of the Office Action that, "Yu(a) and Yu(b) provide motivation for the ordinary artisan to do so (i.e. transform a plant) in contemplating the transformation of any host that can produce anhydrofructose." Applicants dispute that either Yu reference contemplates the transformation of any host that can produce anhydrofructose, and do not find specific sentences in either reference to that effect. In fact, Yu(a) and Yu(b) only disclose, teach and suggest the transformation of microorganisms.

The Office Action further states that, "[t]he ordinary artisan would have been further motivated to produce anhydrofructose as Yu(a) teaches that anhydrofructose can be a precursor for the preparation of the antibiotic pyron microthecin (see col 1, lines 17-20)." Although this statement may have motivated the skilled artisan to produce anhydrofructose *per se*, it does not motivate him to produce the anti-oxidant *in situ* in plants. In fact, this statement teaches away from the present invention, as antibiotics are typically produced in microorganisms.

Prior to the present invention, antioxidants were added as "chemical" additives to foodstuffs, including beverages. For example, antioxidants were used as preservatives in

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foodstuffs, particularly when the foodstuff comprised fats. In addition, in winemaking, prior to the present invention, sulfur dioxide was added to prevent chemical oxidation reactions. Thus, the sulfur dioxide acts as a chemical additive that stabilizes natural grape aromas and flavors (for example, see pages 1-2 of the specification of the present application).

The addition of chemical additives, such as potentially harmful chemicals (i.e., sulfur dioxide) and chemical antioxidants, to foodstuffs is disadvantageous. Thus, the "problem" overcome by the present invention is the unwanted addition of potentially harmful chemicals and chemical antioxidants to foodstuffs.

The present invention seeks to provide foodstuff, which foodstuff is comprised of a plant or part thereof, to which no "external" chemical antioxidants or additives need be added as preservatives or stabilizers. In other words, the present invention seeks to provide a foodstuff which produces its own antioxidant, namely anhydrofructose, *in situ*.

None of the prior art documents teach or suggest a process for producing a foodstuff, including a plant or part thereof, comprising transforming a plant with a nucleotide sequence encoding a recombinant glucan lyase enzyme which acts on a glucan substrate in said plant to yield the antioxidant anhydrofructose *in situ*, thus circumventing the need to add an antioxidant "externally" to said foodstuff. Thus, the present invention provides for an improvement over prior art practices, i.e. the external addition of chemical additives and antioxidants to foodstuffs.

An advantage of providing an antioxidant, namely anhydrofructose, in a foodstuff is that antioxidants are often taken as nutritional supplements. Thus the production of a foodstuff with *in situ* above-normal levels of an antioxidant - anhydrofructose - may circumvent the need for additional nutritional supplements of antioxidants. In addition, a further advantage is to assist transformation of a plant, e.g. a grape, transformed with a nucleotide sequence encoding glucan lyase, which, *in situ*, produces the antioxidant anhydrofructose.

Perl teaches the role of "external" antioxidants during *Agrobacterium*-mediated transformation of grape. As can be seen on page 645, column 1, line 6 *et seq* of Perl, different antioxidants were added to the co-cultivation medium. In contrast, the transformed grapes of the present invention were prepared following the teachings of Perl, "but wherein the combination of polyvinylpolypyrrolidone and dithiothreitol is optional" (page 23, lines 16-18 of the specification).

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Thus, the present invention teaches a transformation method based on Perl, but without the need to add external, chemical antioxidants to the co-cultivation medium. Instead, it was found that, by transforming the grapes with any one of the nucleotide sequences presented as SEQ. ID. No. 7-12 encoding glucan lyase, the transformation was assisted by the *in situ* preparation of the antioxidant anhydrofructose.

The method according to the present invention is not necessarily an improvement over the teaching of Perl, but is rather an alternative means for transforming grape (see page 21, line 13). One improvement presented by the instant invention is that transformation can be assisted without the need to add "external" chemical antioxidants to the co-cultivation medium. That is to say, the difference is that the antioxidant, anhydrofructose, is produced *in situ* in the plant.

Claims 20-25 were rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Yu(a) or Yu(b) in view of Poulsen and Ishida *et al.* and Perl *et al.* and in further view of Adams *et al.* and Kenne *et al.* The rejection is respectfully traversed, and it is submitted that the instant invention is in fact patentable for the reasons stated above.

Further, the Office Action's comments with respect to Adams *et al.* are misguided. Adams *et al.* teach the control of osmotic stress in plants by introduction of the nucleic acid encoding the sugar alcohol mannitol. There is only one indefinite statement in the entire reference that even suggests anti-oxidant activity: "increased mtID [mannitol-1-phosphate dehydrogenase] expression in the chloroplast may also provide anti-oxidant activity." (Col. 51, lines 14-15; emphasis added.) Therefore, the combination of transforming a plant with a glucan lyase enzyme to produce anhydrofructose *in situ* is not *prima facie* obvious.

It is submitted therefore that none of the cited documents, either alone or in combination, would lead the skilled person to express, in a plant, a recombinant enzyme that acts on a glucan substrate to produce an anti-oxidant. None of the references teach the transformation of a plant with a nucleotide sequence encoding glucan lyase for the *in situ* production of the antioxidant anhydrofructose. In addition none of the prior art documents suggest the expression of glucan lyase in a plant to produce anhydrofructose *in situ* in the plant. Therefore, a further improvement of the instant invention is to produce an antioxidant within a plant/foodstuff and to overcome the need to add external chemicals, particularly external chemical antioxidants, to the foodstuff.

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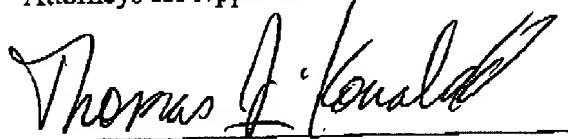
Thus, the claims are novel and inventive (non-obvious) over the cited art. Accordingly, reconsideration and withdrawal of the Section 103 rejections are believed to be in order and such action is respectfully requested.

CONCLUSION

As Applicants have presented at least one new claim, if any Office Action issues in the CPA, it cannot be a first Office Action Final Action. However, in view of the remarks and amendments herewith, the application is believed to be in condition for allowance. Favorable reconsideration of the application and prompt issuance of a Notice of Allowance are earnestly solicited. The undersigned looks forward to hearing favorably from the Examiner at an early date.

Respectfully submitted,

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1. (Twice Amended) [A] In a process for [producing] the addition of an anti-oxidant [in a medium, which medium comprises] to a foodstuff, which foodstuff comprises or is obtained from a plant or part thereof, the improvement comprising [and which process comprises] expressing in the plant or part thereof a recombinant enzyme which acts on a glucan substrate present in the [medium and/or the component] plant or part thereof,] to yield said anti-oxidant; wherein said recombinant enzyme is glucan lyase; wherein said antioxidant is anhydrofructose; and wherein both said glucan lyase and anhydrofructose are produced *in situ* with the plant or part thereof, such that the foodstuff comprises the antioxidant anhydrofructose.

9. (Twice Amended) [The] In the process according to claim 1[8], wherein the enzyme is encoded by a nucleotide sequence having any one of the sequences shown as SEQ ID NOs: 7-12.

21. (Twice Amended) [Method of] In a process for [imparting or] improving the transformation of a plant[grape], which process comprises the addition of an antioxidant; the improvement comprising expressing in the plant or part thereof a recombinant enzyme which acts on a glucan substrate present in the plant or part thereof to yield the antioxidant; wherein said recombinant enzyme is glucan lyase; wherein said antioxidant is [administering] anhydrofructose[;]; and wherein both the glucan lyase and the anhydrofructose [is prepared] are produced *in situ* in the [grape] plant or part thereof, such that the plant comprises the antioxidant anhydrofructose and said anhydrofructose improves the transformation of said plant.